

**Claims**

1. A method of forming at least one crack in a concrete article having at least one crack promoting groove formed in an upper surface thereof, said method comprising the steps of-
- 5 positioning a tool on or above said surface and in or adjacent a said crack promoting groove, said tool having a force applying member; and
- causing said tool to apply through said member a force to said concrete article to promote the formation of a crack in said concrete article along a said groove.
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2. A method as claimed in claim 1 wherein said force applying member comprises an elongated member
3. A method as claimed in claim 2 wherein the length of the impact member is less
- 15 than the length of a groove and wherein said method includes the step of progressively moving the impact tool to different locations longitudinally of the groove and applying an impact force through the force applying member to the concrete article at each location.
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4. A method as claimed in any one of claims 1 to 3 wherein said member is of a configuration such that it may be received within the groove and wherein the step of progressively moving the tool includes the step of moving the member to different locations for location within the groove.
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5. A method as claimed in any one of claims 1 to 3 wherein said member is positioned adjacent to or above the groove for application of the force to the concrete article.
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6. A method as claimed in any one of claims 1 to 5 wherein said concrete article has a plurality of crack promoting grooves in its upper surface arranged in a grid and wherein said method includes the step of causing the force applying member to apply a force or forces to the concrete article to promote the formation of a plurality of cracks in the concrete article along the grooves in the grid.

7. A method of forming at least one crack in a concrete article having at least one crack promoting insert cast within the concrete article, said method comprising the steps of: -

- 5       positioning a tool having a force applying member on or above the surface of the concrete article whereby said member is located adjacent to or above said insert, and  
          causing said tool to apply through said force applying member a force to said concrete article to promote the formation of a crack in said concrete article along a said insert.

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8. A method as claimed in claim 7 wherein said force applying member comprises an elongated member.

9. A method as claimed in claim 8 wherein the length of the member is less than the  
15 length of said insert, and wherein said method includes the step of progressively moving the member to different locations longitudinally of the insert and applying t a force to the concrete article at each location.

10. A method as claimed in any one of claims 7 to 9 wherein said concrete article has  
20 a plurality of crack promoting inserts arranged in a grid and wherein said method includes the step of causing the force applying member to apply a force or forces to the concrete article to promote the formation of a plurality of cracks in the concrete article along the inserts in the grid.

- 25 11. A method of forming at least one crack in a concrete article having at least one crack promoting groove formed in the surface thereof and at least one crack promoting insert cast within the concrete article substantially aligned with said at least one groove, said method comprising the steps of: -

- 30       positioning a tool having a force applying member on or above the surface of the concrete article such that said member is positioned adjacent to or above a groove and insert, and

causing said tool to apply through said member a force to said concrete article to promote the formation of a crack in said concrete article along a said insert and between said insert and an aligned groove.

5 12. A method as claimed in claim 11 wherein said insert is positioned immediately below or to one side of a said groove.

13. A method as claimed in claim 11 or 12 wherein said force applying member comprises an elongated member

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14. A method as claimed in claim 13 wherein where the length of the force applying member is less than the length of the groove and/or insert, and wherein said method includes the step of progressively moving the tool to different locations along the groove and/or insert and applying a force through the member to the concrete article at each  
15 location.

15. A method as claimed in any one of claims 11 to 14 wherein said member is of a configuration such that it may be received within the groove and wherein the step of progressively moving the tool includes the step of moving the member to different  
20 locations for location within the groove.

16. A method as claimed in any one of claims 11 to 15 wherein said concrete article includes a plurality of crack promoting grooves arranged in a grid and a plurality of corresponding crack promoting inserts arranged in a grid and wherein respective grooves  
25 are substantially aligned with respective inserts, said method including the step of causing the force applying member to apply a force or forces to the concrete article to promote the formation of a plurality of cracks in the concrete article along the inserts in the grid and between the inserts and aligned grooves.

30 17. A method as claimed in any one of claims claim 11 to 16 wherein said member is positioned adjacent to or above the groove for application of the force to the concrete article.

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18. A method as claimed in claim 17 wherein said impact member is positioned within a groove.

19. A method as claimed in any one of the preceding claims wherein said concrete article comprises a concrete slab including reinforcing.

20. A method as claimed in any one of claims 1 to 18 wherein said concrete article comprises a concrete slab without reinforcing.

21. A method as claimed in any one of the preceding claims wherein said tool comprises an impact applying tool and wherein said force applying member comprises an impact applying member and wherein said step of applying a force to the concrete article comprises the step of applying an impact force through said impact applying member to the concrete article.

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22. A method as claimed in claim 21 wherein said step of applying an impact force comprises the step of resting the impact member against the article and applying an impact force to the impact member.

23. A method as claimed in claim 21 wherein said step of applying an impact force to the concrete article comprises the step of striking the impact member directly against the article.

24. A method as claimed in claim 22 and including a mechanical, pneumatic or hydraulic drive associated with the impact member and wherein said step of applying an impact force to the concrete article comprises the step of operating said drive to cause an impact to be applied to the impact member.

25. A method as claimed in claim 23 and including a mechanical, pneumatic or hydraulic drive associated with the impact member and wherein said step of applying an impact force to the concrete article comprises the step of operating said drive to cause the impact member to strike the concrete article.

26. A method as claimed in claim 24 wherein said drive comprises means to elevate a weight and means for dropping the weight against impact member.
27. A method as claimed in claim 25 wherein said drive comprises means to elevate  
5 and drop the impact member against the article.
28. A method as claimed in any one of claims 1 to 20 wherein said tool comprises a vibrator for applying a vibratory force to said concrete article.
- 10 29. A method as claimed in any one of the preceding claims wherein said tool includes a plurality of force applying members and wherein said method includes the step of causing each member to apply a force to the concrete article.
30. A method as claimed in claim 29 wherein said method includes the step of  
15 causing each member to apply a force to the concrete article simultaneously.
31. A method as claimed in claim 29 wherein said method includes the step of causing each member to apply a force to the concrete article sequentially.
- 20 32. A method as claimed in any one of claims 1 to 6 or 11 to 18 wherein said grooves are formed in the article during the concrete finishing process.
33. A method as claimed in any one of claims 1 to 6 or 11 to 18 wherein said grooves are cut in the concrete article after the concrete finishing process.  
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34. A method as claimed in any one of claims 7 to 18 wherein said inserts have a "T" shaped configuration and are placed in an inverted orientation.
35. A method as claimed in any one of claims 7 to 18 or 34 wherein said inserts are  
30 arranged at rights angles to each other to intersect each other and wherein said inserts interlock with each other at their points of intersection.

36. . A method as claimed in any one of claims 7 to 18 or 34 wherein said inserts are arranged at right angles to each other and including connectors for interconnecting said inserts.

5 37. A method as claimed in any one of the preceding claims wherein said force applying member comprises an elongated planar member having a force applying face, said member including a strip of cushioning material on said face.

38. Apparatus for forming at least one crack in a concrete article provided with at  
10 least one crack promoting groove and/or at least one crack promoting insert, said apparatus including a chassis, said chassis supporting a tool having a force applying member, and means for causing said tool to apply through said member a force to said concrete article to promote the formation of a crack in said concrete article along a crack promoting groove and/or a crack promoting insert.

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39. Apparatus as claimed in claim 38 wherein said chassis comprises a mobile chassis whereby said apparatus may be moved to different positions on the concrete article, said chassis supporting at least one pair of steerable wheels.

20 40. Apparatus as claimed in claim 39 wherein said chassis supports two pairs of steerable wheels, said wheels being steerable whereby said chassis may be moved laterally for repositioning said tool.

41. Apparatus as claimed in any one of claims 38 to 40 wherein said tool comprises  
25 an elongated contact beam comprising the force applying member and means for applying a force to the contact beam.

42. Apparatus as claimed in claim 41 and including means for supporting said contact  
30 beam for movement between a first position where it is elevated above the surface of a concrete article and a second position where it is in contact with the surface of the concrete article.

43. Apparatus as claimed in claim 42 wherein said contact beam extends longitudinally of the chassis.

44. Apparatus as claimed in claim 42 wherein said contact beam extends transversely  
5 of the chassis.

45. Apparatus as claimed in claim 43 or 44 wherein said chassis supports guides for guiding the contact beam between its first and second positions.

10 46. Apparatus as claimed in claim 45 wherein said guides comprises guides at opposite ends of said contact beam and elevating and lowering means associated with each guide for elevating and lowering said contact beam.

47. Apparatus as claimed in claim 46 wherein said elevating and lowering means  
15 comprise hydraulic rams.

48. Apparatus as claimed in any one of claims 38 to 47 wherein said tool comprises an impact tool and wherein said means for applying a force to said contact beam comprises a weighted member comprising an impact beam above said contact beam for  
20 applying an impact to said contact beam.

49. Apparatus as claimed in claim 48 and including means for elevating said impact beam above said contact beam and means for releasing said impact beam to permit said impact beam to drop under the influence of gravity towards said contact beam.

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50. Apparatus as claimed in claim 49 wherein said impact beam comprises an elongated beam extending substantially parallel to said contact beam and means at opposite ends of said elongated beam for guiding said elongated beam towards and away from said contact beam.

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51. Apparatus as claimed in claim 49 or 50 wherein said means for elevating said impact beam comprises a vertically extendable member and wherein said means for

releasing said impact beam comprise releasable latching means for releasably latching said impact beam to said vertically extendable member.

52. Apparatus as claimed in any one of claims 48 to 51 and including cushioning  
5 means between said impact beam and contact beam for cushioning the impact between said impact beam and contact beam.

53. Apparatus as claimed in claim 52 wherein said cushioning means comprise a  
10 plurality of cushioning members on an upper side of said contact beam.

54. Apparatus as claimed in any one of claims 38 to 47 wherein said tool comprises a  
vibrator for applying a vibratory force to said concrete article through said force applying  
member.

15 55. Apparatus as claimed in any one of claims 41 to 54 wherein said contact beam includes a contact member for contact with the surface of the concrete article.

56. Apparatus as claimed in claim 55 wherein said contact member comprises a  
20 planar member.

57. Apparatus as claimed in claim 56 wherein said planar member is provided with a  
strip of cushioning material.

58. Apparatus as claimed in claim 55 wherein said contact member comprises a  
25 blade-like member.

59. Apparatus according to any one of claims 38 to 58 and including a laser guidance  
system for guiding movement of said apparatus over said concrete article.

30 60. Apparatus according to claim 59 wherein said laser guidance system includes means for establishing a laser plane offset from and parallel to a row of inserts or line of grooves and laser receivers on the apparatus aligned with a longitudinal axis of said apparatus.